*United States Environmental Protection Agency*
*Office of Water*
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## Wadeable Streams Assessment

# Field Operations Manual


July 2004

FINAL

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# WADEABLE STREAM ASSESSMENT: FIELD OPERATIONS MANUAL

## NOTICE

The intention of the WSA project is to provide a comprehensive "State of the Streams" assessment for streams across the United States. The complete documentation of overall WSA project management, design, methods, and standards is contained in five companion documents, including:

- *Wadeable Streams Assessment: Quality Assurance Project Plan*
- *Wadeable Streams Assessment: Site Evaluation Guidelines*
- *Wadeable Streams Assessment: Field Operations Manual*
- *Wadeable Streams Assessment: Benthic Laboratory Methods*
- *Wadeable Streams Assessment: Water Chemistry Laboratory Manual*

This document (*Field Operations Manual*) contains a brief introduction, procedures to follow at the base location and on-site, including methods for sampling water chemistry (grabs and *in situ*), stream discharge, benthic macroinvertebrates, and physical habitat. These methods are based on the guidelines developed and followed in the Western Environmental Monitoring and Assessment Program (Peck et al. 2003). Methods described in this document are to be used specifically in work relating to WSA. All Project Cooperators should follow these guidelines. Mention of trade names or commercial products in this document does not constitute endorsement or recommendation for use. More details on specific methods for site evaluation, sampling, and sample processing can be found in the appropriate companion document.

The suggested citation for this document is:

> USEPA. 2004. Wadeable Stream Assessment: Field Operations Manual. EPA841-B-04-004. U.S. Environmental Protection Agency, Office of Water and Office of Research and Development, Washington, DC.

## FOREWORD

The strategic plan of USEPA calls for a report on the results of a statistical survey of the condition of the Nation's waters, conducted in cooperation with the states. Therefore, USEPA's Office of Water with support from the Office of Research and Development is initiating a national assessment of the ecological condition of wadeable streams by collaborating with state water quality agencies. The result is a Wadeable Streams Assessment (WSA) Program that consists of a comprehensive program for surveying, assessing, and diagnosing ecological condition. This assessment will generate statistically valid estimates of the ecological health of streams through sampling a representative assemblage of the aquatic community and associated ecological data. A determination of related causes and sources of degradation to these aquatic resources will be investigated.

This document contains the field operations and bioassessment methods for evaluating the health and biological integrity of wadeable freshwater streams throughout the United States. These methods can be used by state and tribal water quality agencies as well as USEPA regional, enforcement, and research programs engaged in condition assessments and/or trends monitoring for the effects of impacts on aquatic organisms, particularly benthic macroinvertebrates in wadeable streams throughout the nation. The program addresses methods and techniques for sample collection; sample preparation; processing of structural and functional measures by using organism identification and enumeration; the survey and evaluation of physical habitat structure; the computerization, analysis, and interpretation of biological data; and ecological assessments.

Companion documents include the overall Quality Assurance Program Plan (QAPP) and Laboratory Operations Manuals for processing the benthic macroinvertebrate assemblage samples and water chemistry.

## ABSTRACT

The Wadeable Streams Assessment program focuses on the use of a consistent scientific and technical tools for evaluating ecological conditions on regional and national scales. The methods and instructions for field operations presented in this manual for surveys of wadeable streams were initially developed and tested during 5 years of pilot and demonstration projects (1993 - 1997) and modified for use in a study of streams in the Western US (2000-2002). These projects were conducted under the sponsorship of the U.S. Environmental Protection Agency and its collaborators through the Environmental Monitoring and Assessment Program (EMAP). This document describes procedures for collecting data, samples, and information about the benthic macroinvertebrate assemblage, environmental measures, or attributes of indicators of stream ecosystem condition, and were developed based on standard or accepted methods, modified as necessary to adapt them to sampling requirements for the Wadeable Streams Assessment. They are intended for use in field studies sponsored by the USEPA, or monitoring programs developed and implemented by various State and tribal agencies. In addition to methodology, additional information on data management, safety and health, and other logistical aspects is integrated into the procedures and overall operations. Procedures are described for collecting field measurement data and/or acceptable index samples for several response and stressor indicators, including water chemistry, physical habitat, and benthic macroinvertebrate assemblages. The manual describes field implementation of these methods and the logistical foundation constructed during field projects. Flowcharts and other graphic aids provide overall summaries of specific field activities required to visit a stream site and collect data for these indicators. Tables give step-by-step procedural instructions. These figures and tables can be extracted and bound separately to make a convenient quick field reference for field teams. The manual also includes example field data forms for recording measurements and observations made in the field and sample tracking information. Checklists of all supplies and equipment needed for each field task are included to help ensure that these materials are available when required.

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## ACRONYMS, ABBREVIATIONS, AND MEASUREMENT UNITS

### Acronyms and Abbreviations

| | |
|---|---|
| AFDM | Ash-free dry mass |
| APA | Acid/Alkaline Phosphatase Activity |
| BPJ | Best Professional Judgment |
| BOD | Biological Oxygen Demand |
| CENR | (White House) Committee on the Environment and Natural Resources |
| CFR | Code of Federal Regulations |
| dbh | Diameter at breast height |
| DC | Direct Current |
| DIC | Dissolved Inorganic Carbon |
| DLGs | Digital Line Graphs |
| DO | Dissolved oxygen |
| EERD | Ecological Exposure Research Division |
| EMAP | Environmental Monitoring and Assessment Program |
| EMAP-SW | Environmental Monitoring and Assessment Program-Surface Waters Resource Group |
| EMAP-WP | Environmental Monitoring and Assessment Program-Western Pilot study |
| EPA | U.S. Environmental Protection Agency |
| ERB | Ecosystems Research Branch |
| GPS | Global Positioning System |
| ID | identification |
| LWD | Large Woody Debris |
| MAHA | Mid-Atlantic Highlands Assessment |
| MAIA | Mid-Atlantic Integrated Assessment |
| NAWQA | National Water-Quality Assessment Program |
| NERL | National Exposure Research Laboratory |
| NHEERL | National Health and Environmental Effects Research Laboratory |
| ORD | Office of Research and Development |
| OSHA | Occupational Safety and Health Administration |
| P-Hab | physical habitat |
| PVC | polyvinyl chloride |
| QA | quality assurance |
| QC | quality control |
| RBP | (EPA) Rapid Bioassessment Protocols |
| R-EMAP | Regional Environmental Monitoring and Assessment Program |
| SL | Standard length |
| SOP | Standard Operating Procedure |
| TIME | Temporally Integrated Monitoring of Ecosystems |
| TL | Total length |
| USGS | United States Geological Survey |
| WED | Western Ecology Division |
| WSA | Wadeable Streams Assessment |
| YOY | young of year |
| YSI | Yellow Springs Instrument system |

## ACRONYMS, ABBREVIATIONS, AND MEASUREMENT UNITS (CONTINUED)

### Measurement Units

| | |
|---|---|
| amps | amperes |
| cm | centimeter |
| ft | foot |
| gal | gallon |
| ha | hectare |
| Hz | Hertz |
| in | inches |
| L | liter |
| m | meter |
| $m^2$ | square meters |
| mg/L | milligram per liter |
| mm | millimeter |
| µm | micrometer |
| µS/cm | microsiemens per centimeter |
| mS/cm | millisiemens per centimeter |
| msec | millisecond |
| ppm | parts per million |
| psi | pounds per square inch |
| V | volts |
| VA | volt-ampere |